

## **Improved Vertical MOSFET with dual work function materials**

### **Abstract of the Disclosure**

A vertical pass transistor used in a DRAM cell for maintaining a low total leakage current and providing adequate drive current is described together with a method of fabricating such a device. The transistor gate is engineered in lieu of the channel. The vertical pass transistor for the DRAM cell incorporates two gate materials having different work functions. The gate material near the storage node is n-type doped polysilicon. The gate material near the bit line diffusion is made of silicide or metal having a higher work function than the n-polysilicon. The novel device structure shows several advantages: the channel doping is reduced while maintaining a high  $V_t$  and a low sub-threshold leakage current; the carrier mobility improves with the reduced channel doping; the body effect of the device is reduced which improves the write back current; and the sub-threshold swing is reduced because of the low channel doping.